REMARKS

Claims 1-18 are pending in this application. In an Official Action dated October 1, 2007, claims 1-18 were rejected.

Based on the following Remarks, Applicants respectfully request that Examiner withdraw all outstanding rejections.

Response to Rejection Under 35 USC §103(a)

The Examiner rejected claims 1-18 under 35 USC § 103(a) as unpatentable over PCT Application No. US97/08266 to Chang et al. ("Chang") in view of U.S. Patent No. 6,670,963 to Osberger. ("Osberger"). This rejection is respectfully traversed.

Claim 1 recites:

> A method of detecting at least one of a pan and a zoom in a video sequence, comprising:
>
> selecting a set of frames from a video sequence;
>
> determining a set of motion vectors for each frame in the set of frames;
>
> determining a motion angle for each motion vector;
>
> identifying at least two largest regions in each frame having motion vectors with substantially similar motion angles;
>
> determining percentages of each frame covered by the at least two largest regions;
>
> determining a statistical measure of the motion angles for at least one of the two largest regions; and
>
> comparing the percentages and statistical measure to threshold values to identify at least one of a pan and a zoom in the video sequence.

The claimed method detects the presence of a pan or a zoom in a video sequence. Initially a set of frames are selected from the video sequence and a set of motion vectors are determined for each frame in the set. A motion angle describing motion vector orientation is then determined for each motion vector. At least two largest regions in each

frame having motion vectors with substantially similar motion angles are then identified. The percentage of each frame covered by the at least two largest regions is then determined. A statistical measure of the motion angles for at least one of the identified two largest regions is computed and compared to threshold values to identify a pan or a zoom.

Thus, the claimed method detects a pan or a zoom by identifying the two largest regions of each frame in a video sequence having substantially similar motion vector orientation. Motion angles are computed for each motion vector and the motion angles are used to identify the regions that have substantially similar motion vector orientation. By identifying the two largest regions of each frame having a substantially similar motion vector orientation, the claimed method allows for pan or zoom detection without computing global motion parameters (i.e., computing motion where most of the image points are uniformly displaced). Further, determining motion angles for each motion vector allows for rapid identification of frame regions having substantially similar motion vector orientation by evaluating the similarity of the motion angles. Determining a statistical measure for one of the largest frame region, rather than the entire frame, reduces the computation necessary to detect a pan or a zoom in the frame, beneficially improving the efficiency of pan or zoom detection.

In contrast, Chang merely discloses detecting moving objects within a frame by identifying areas of a frame that have motion vectors different than other, non-moving, areas of the frame (Chang, page 17, lines 4-6). This detection merely compares motion vectors to a predetermined threshold value to eliminate areas of the frame where motion vectors are below the predetermined threshold value (Chang, page 17, line 8). Chang further uses a linear transformation and a translation to identify moving and non-moving regions of a frame rather than "at least two largest regions in each frame having motion

vectors with substantially similar motion angles," as claimed. Further, as Chang does not identify "at least two largest regions in each frame having motion vectors with substantially similar motion angles," Chang cannot determine "percentages of each frame covered by the at least two largest regions," as recited in claim 1. Because Chang detects all regions in a frame where motion vectors exceed the largest threshold value, there is no determination of the "percentages of each frame covered by the at least two larges regions." Further, the Examiner admits that Chang does not explicitly disclose determining percentages of each frame covered by the at least two largest regions.

Osberger fails to remedy the deficient disclosure of Chang. Rather, Osberger discloses a segmentation algorithm that divides a video frame into a plurality of regions based on color and luminance (Osberger, Abstract). The disclosed segmentation algorithm also processes a current frame and a previous frame to produce motion vectors for the current frame (Osberger, 2:33-37). However, Osberger examines frame-wide motion vectors associated with a current frame and a previous frame to generate an importance map for the current frame (Osberger, 3:23-30). There is no disclosure or suggestion in Osberger of "determining percentages of each frame covered by the at least two largest regions," as claimed. Osberger merely estimates motion in a scene by taking the m^{th} percentile, such as the 98^{th} percentile, of the camera motion compensated motion vector map (Osberger, 7:61-64). This motion estimation does not determine "percentages of each frame covered by the at least two largest regions," but merely specifies a threshold which discounts a portion of the motion vectors present in a complete frame. For example, the disclosed motion estimation in Osberger examines 98% of the motion vectors in an entire frame to determine the amount of motion and does not account for 2% of the frame-wide motion vectors. Hence, motion vectors from the frame as a whole, not from different re-

gions within the frame, are analyzed in Osberger. The motion analysis disclosed in Osberger examines individual frames in their entirety and does not identify "at least two largest regions in each frame having substantially similar motion angles" or determine percentages of each frame covered by the at least two largest regions," as claimed.

Thus, neither of the cited references, taken alone or in combination, teaches the claimed invention. Therefore, claim 1 is patentable over the cited references and withdrawal of the rejection is respectfully requested.

Claims 7 and 13 similarly recite identifying "at least two largest regions in each frame having substantially similar motion angles" and determining "percentages of each frame covered by the at least two largest regions." Therefore, claims 7 and 13 are patentable over the cited references, both alone and in combination, for at least the same reasons discussed above with respect to claim 1.

In addition to reciting their own patentable features, claims 2-6, 8-12 and 14-18 variously depend from patentable base claims 1, 7 and 13. Accordingly each of dependent claims 2-6, 8-12 and 14-18 are also patentable.

The Examiner also rejected claim 16 as unpatentable over Chang and Osberger in view of Official Notice. However, the Official Notice relied upon by the Examiner does not overcome the deficiencies of Chang and Osberger. The Official Notice merely indicates that polar coordinates are a form of mathematical representation. However, this Official Notice does not disclose "determining percentages of each frame covered by the at least two largest regions" or "identifying at least two largest regions in each frame having motion vectors with substantially similar motion angles," as claimed. Therefore, the combination of Chang, Osberger and Official Notice fails to disclose the subject matter of claim 16.

Thus, claim 16 is patentably distinguishable over the cited references, both alone and in combination and withdrawal of the rejection is respectfully requested.

Should the Examiner wish to discuss the above remarks, or if the Examiner believes that for any reason direct contact with Applicants' representative would help to advance the prosecution of this case to allowance, the Examiner is invited to telephone the undersigned at the number given below.

Respectfully submitted,
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